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4 different papers enclosed for Task # 78

\* Paper Rec'd After 30-day Deadline = 16 days until Deadline No rush issued

MEMORANDUM FOR PRS (In-House Publication)

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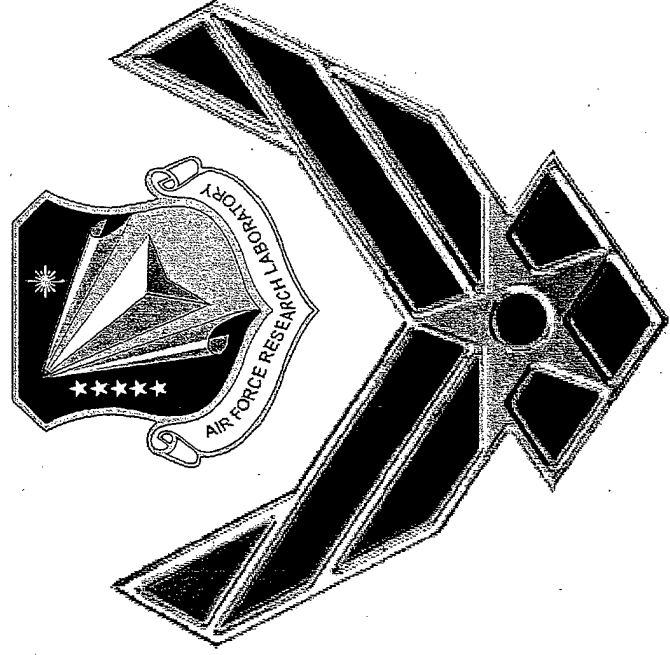
01 Nov 2002

SUBJECT: Authorization for Release of Technical Information, Control Number: ~~AFRL~~ **PR-ED-VG-2002-258**  
C.T. Liu (PRSM) et al., "Multi-Scale Strain Measurements of a Particular ~~Fe~~ Composite Material"  
(viewgraphs only)

ASME Int'l Mechanical Engineering Congress & Exhibit  
(New Orleans, LA, 17-22 November 2002) (Deadline: 15 Nov 02)

(Statement A)

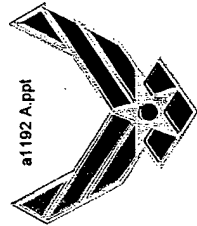
# Multi-Scale Strain Measurements of a Particulate Composite Material



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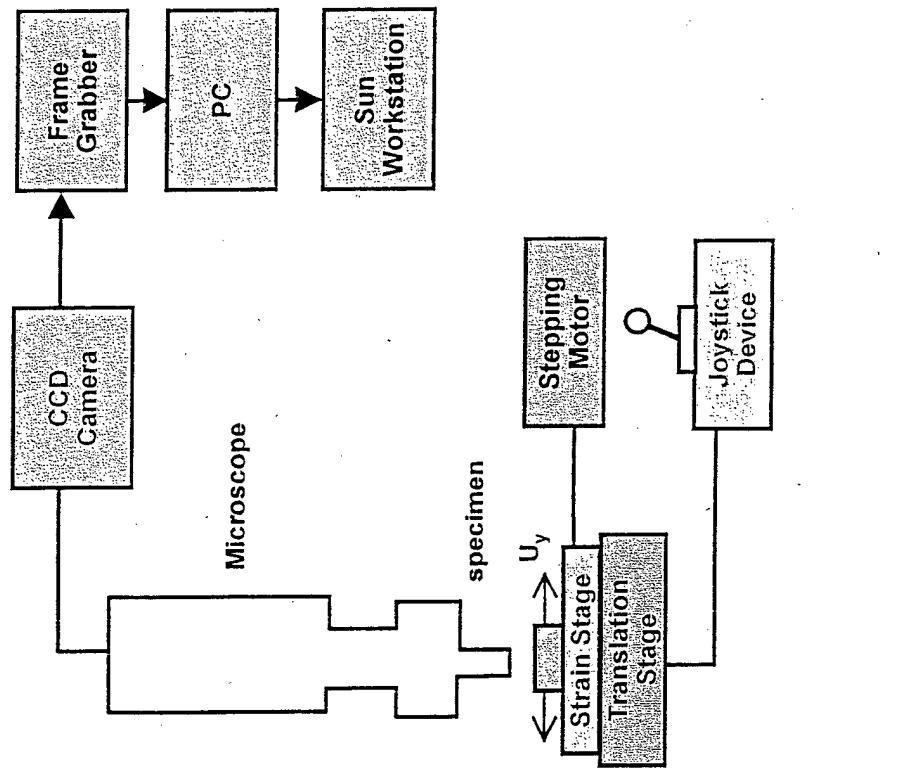
# Objectives



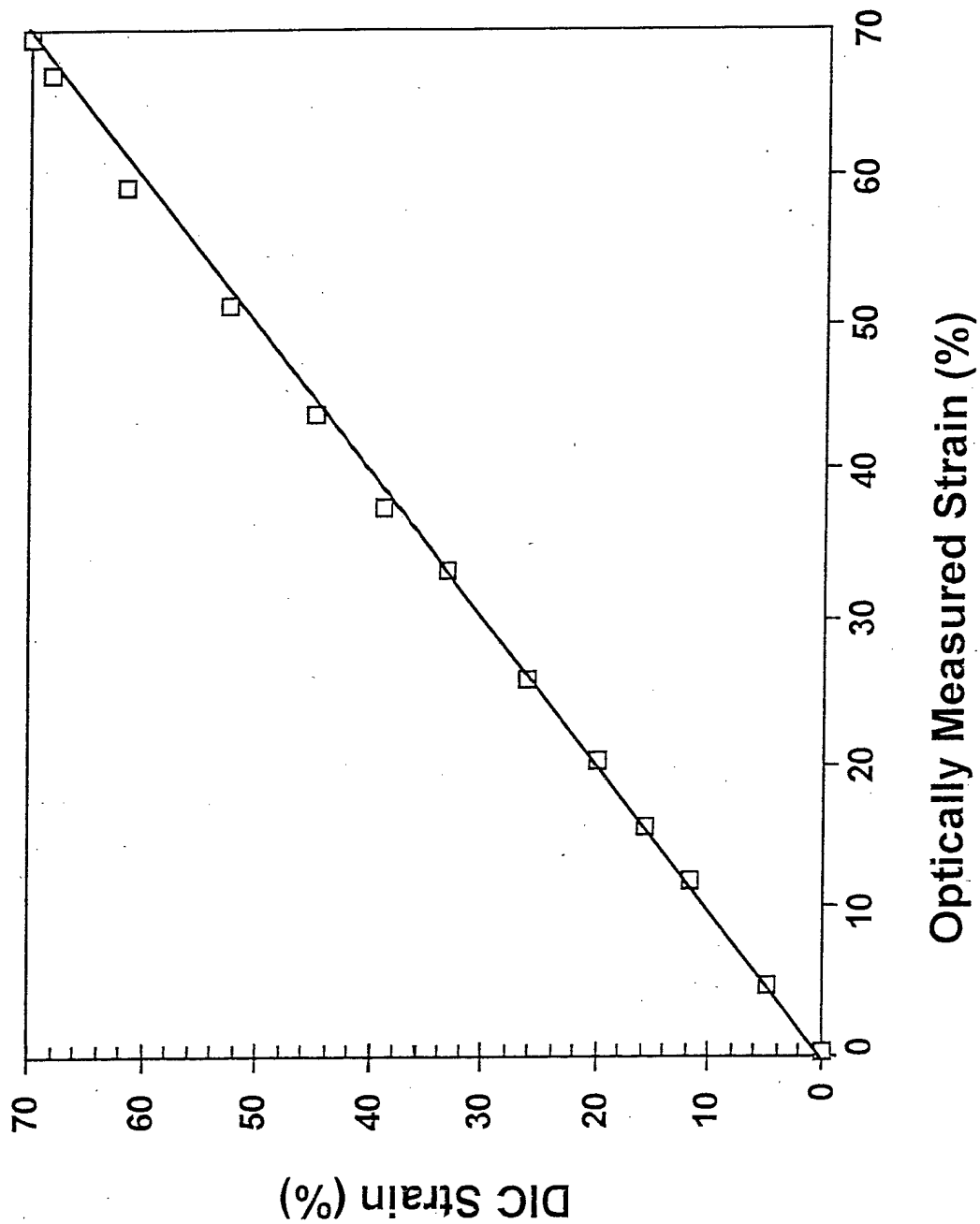
- ✚ Investigate the Effect of Microstructure on the Strain Distributions Near a Crack Tip
- ✚ Conduct Numerical Modeling Analysis to Determine the Displacement and Strain Fields



10 June 24/02 MESO

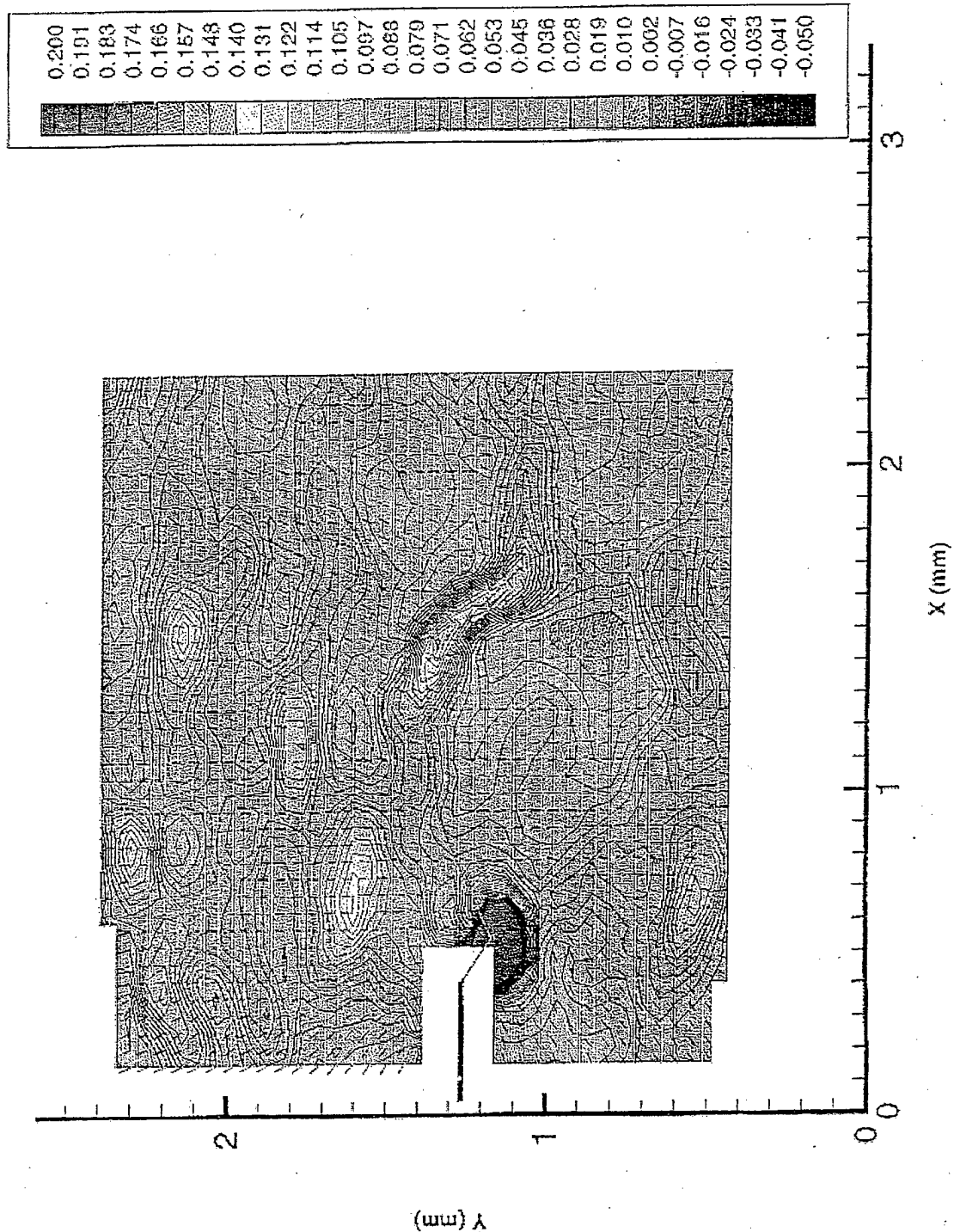


# Calibration





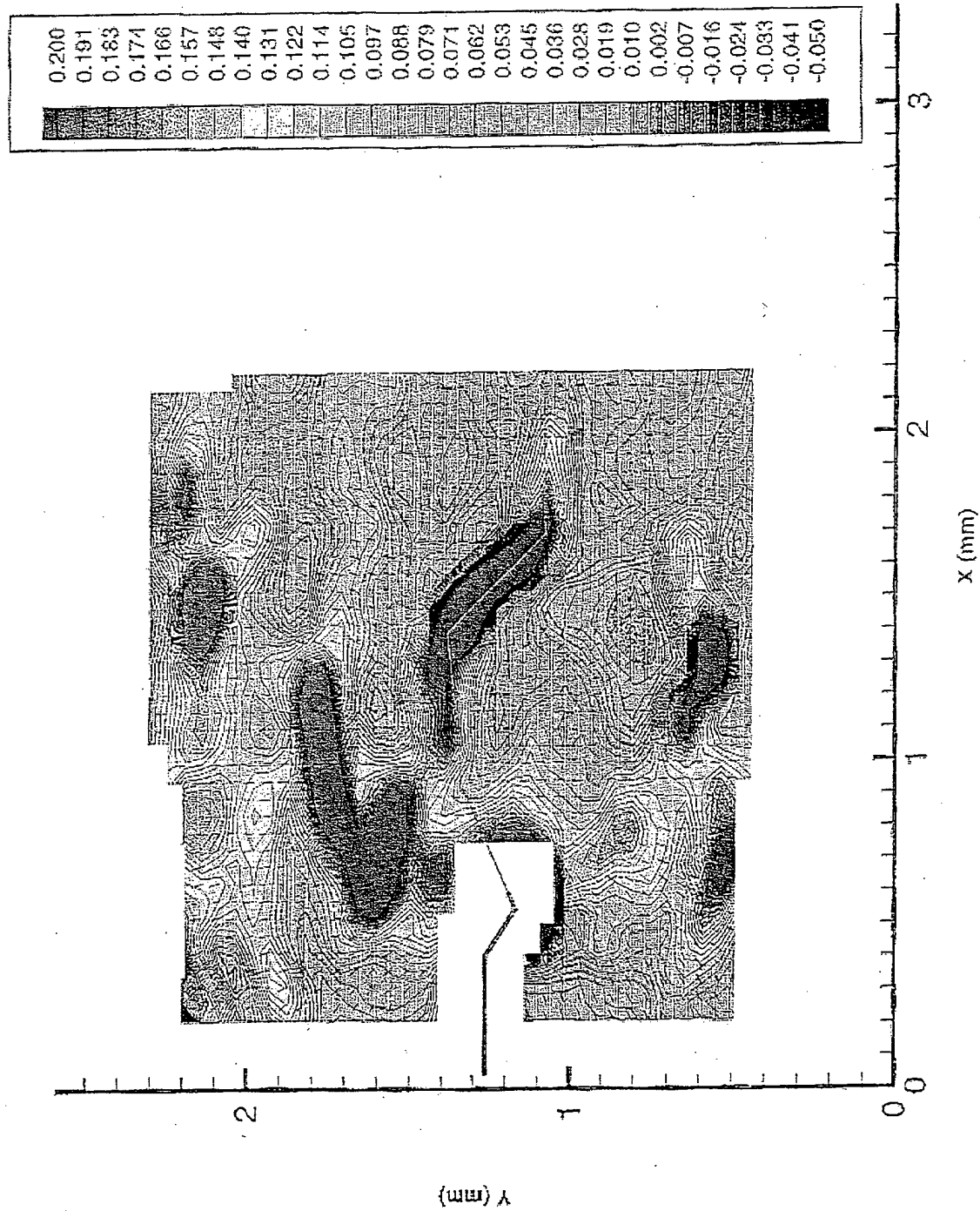
# Maximum Principal Strain Distribution of 6.0% Far Field Strain During Loading



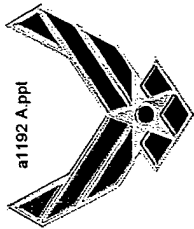


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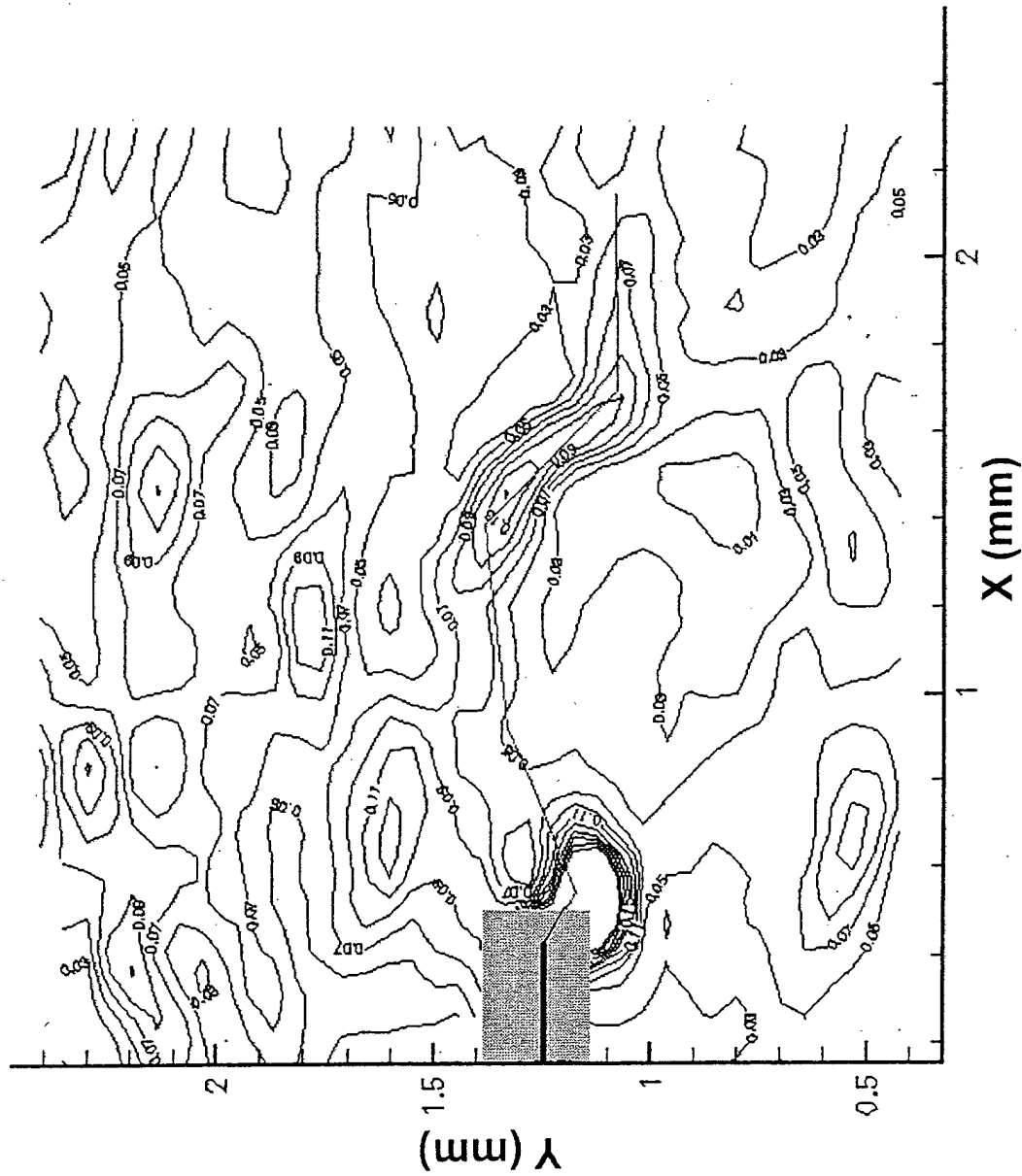
# Maximum Principal Strain Distribution of 10.0% Far Field Strain During Loading

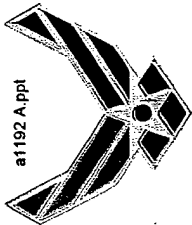




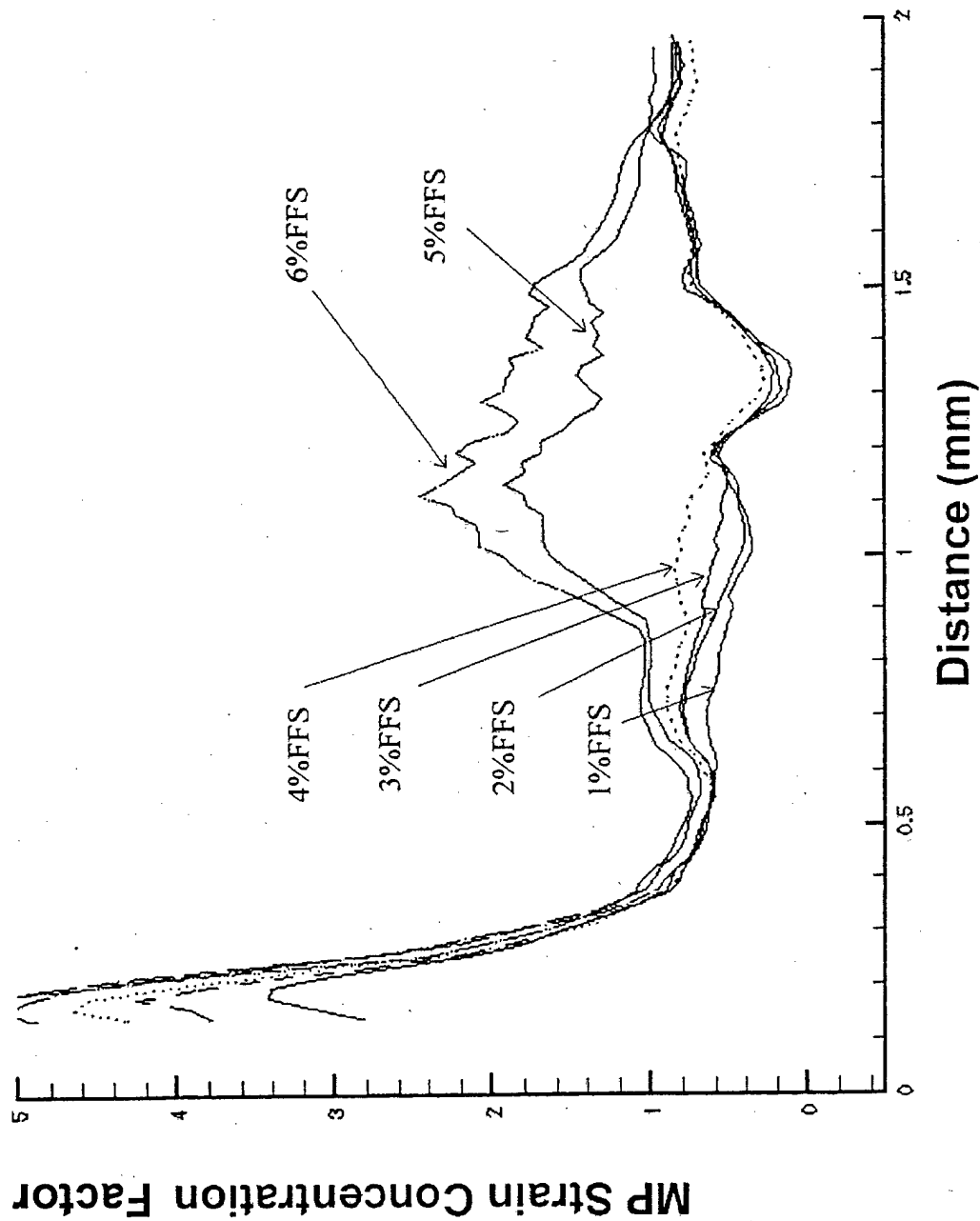


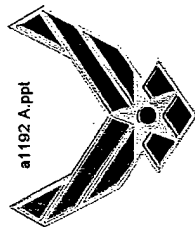
# Maximum Principal Strain at 6% Far Field Strain



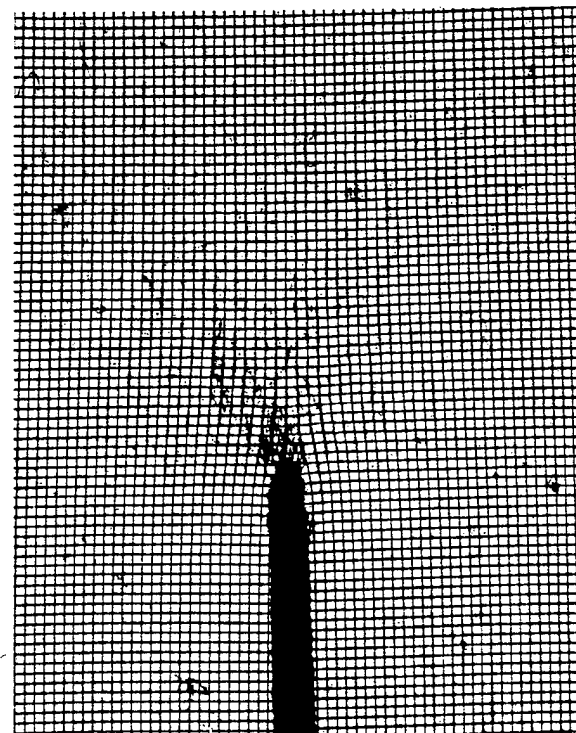
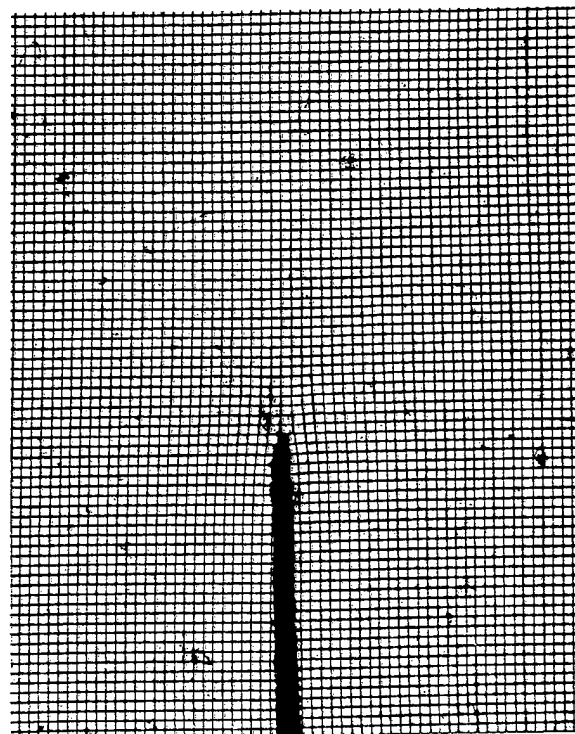
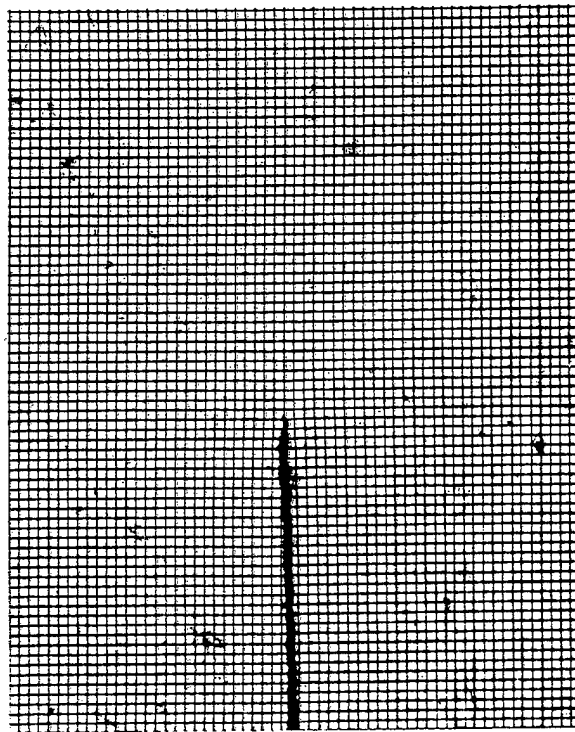


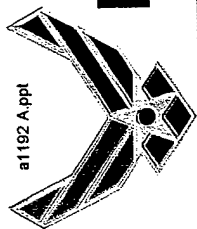
# Maximum Principal Strain Concentration Factor at Various Far Field Strain Values



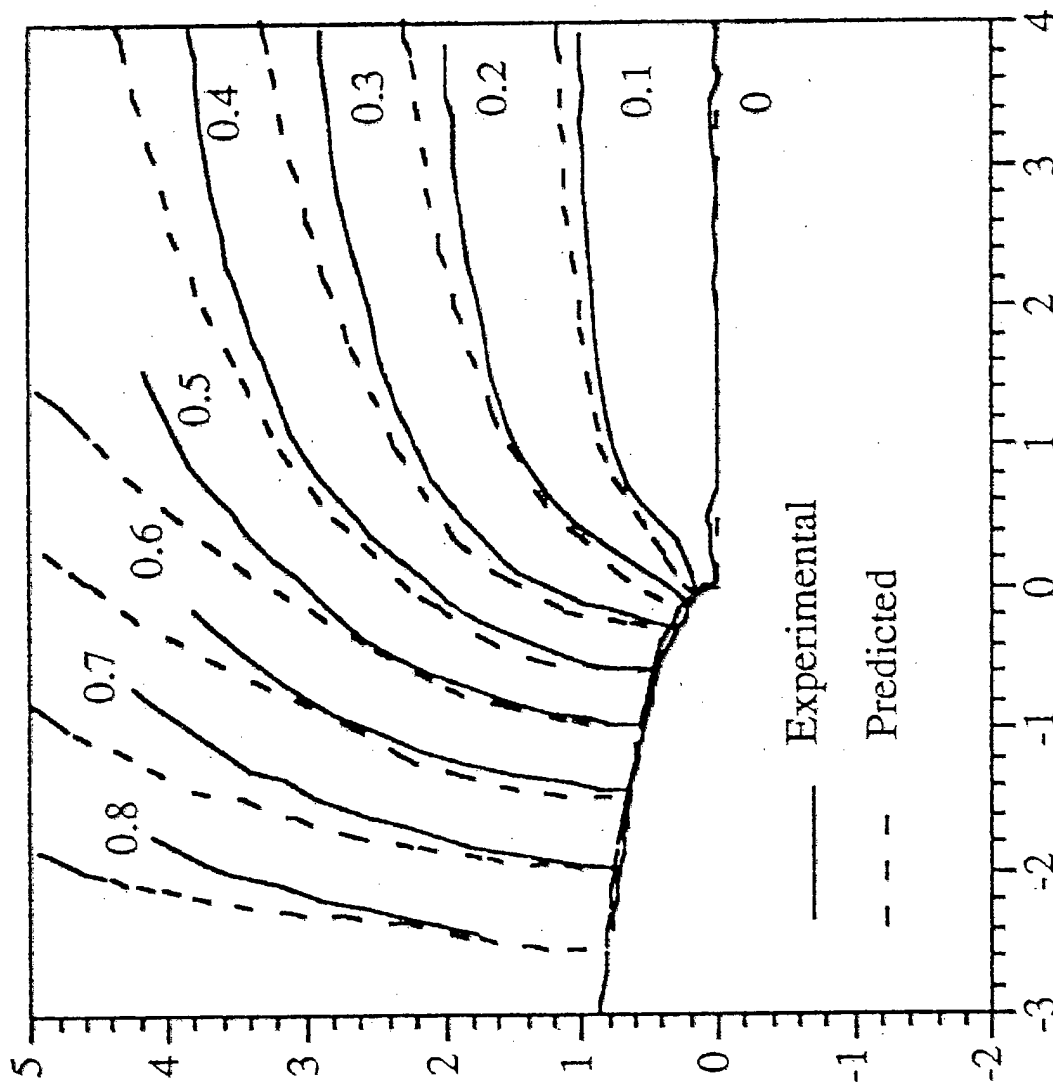


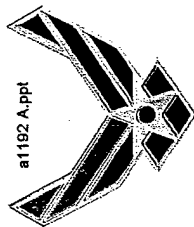
# Grid Deformation During the Crack Blunting Phase



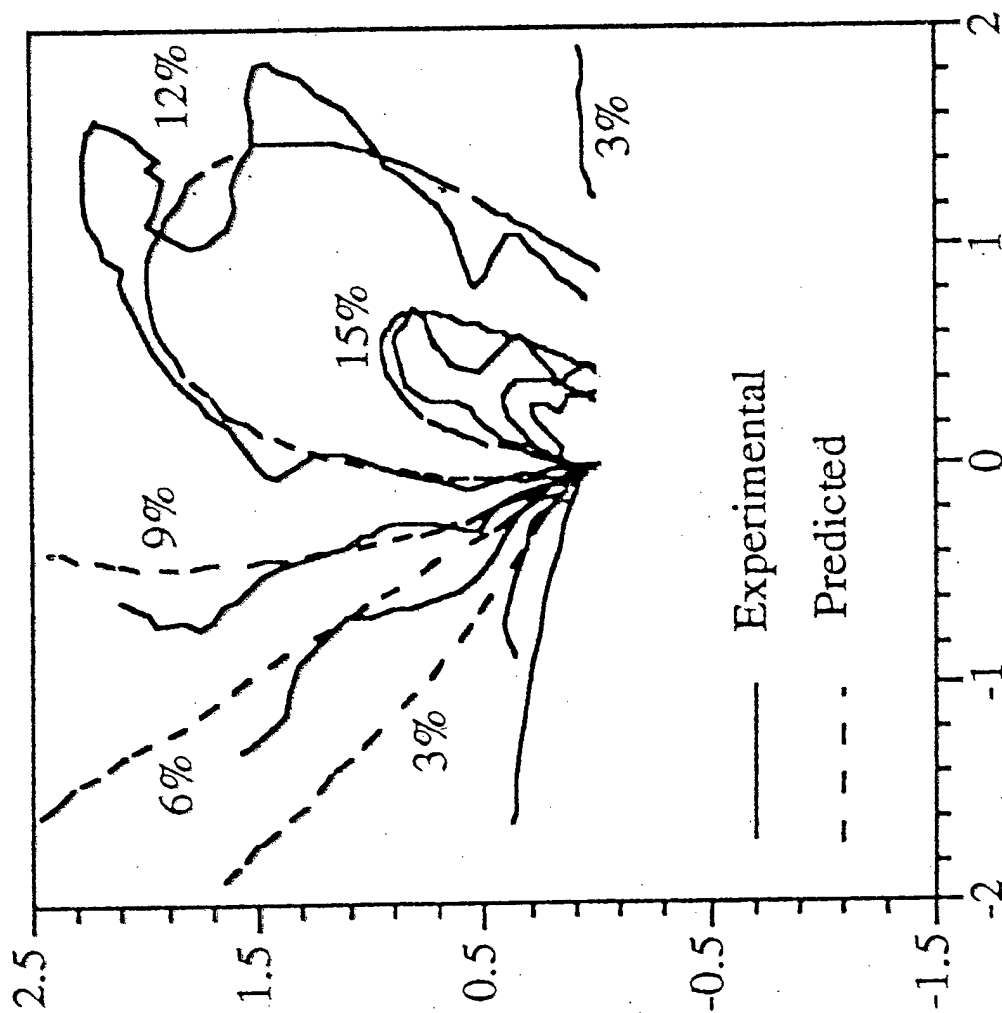


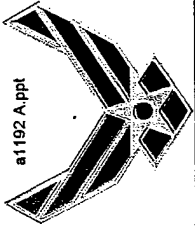
# Contours of Constant Vertical Displacement (V) in the Crack Tip Region





# Finite Element Results for a Normal Strain Contours Superimposed Upon Experimental Result





# Conclusions



- ✖ The Microstructure of the Material has a Significant Effect on the Strain Fields Near the Crack Tip
- ✖ The Crack Growth Mechanism Consists of Void Generation and Coalescence with the Main Crack Tip
- ✖ The Displacement and Strain Fields Determined from Numerical Modeling Analysis Compare well with Experimental Results